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AUTHOR Lilly, Edward R.
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ABSTRACT

Designed to assist teachers and administrators approaching the subject of computers for the first time to acquire a feel for computer terminology, this document presents a computer term glossary on three levels. (1) The terms most frequently used, called a "basic vocabulary," are presented first in three paragraphs which explain their meanings: analog and digital, binary, programming, hardware, software, CPU ("central processing unit"), peripheral, memory, mass storage units, terminal, keyboard, display device, operating systems, computer languages, application programs, and microcomputer. (2) A summary of these concepts is then provided, followed by (3) a basic vocabulary list which includes detailed definitions or cross references for approximately 180 computer terms. (JB)

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Edward R. Lilly, Ph.D.
Associate Professor
The City College
of The City University of New York

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UNDERSTANDING COMPUTER TERMS

Computer science, not unlike other disciplines, has developed a language of its own. Much of this development consists of words in general use which have taken on rather restricted meanings when used in a computer related context more often new expressions have evolved. Many of the terms are acronyms which are pronounceable words formed from the letters of other words, for example: FORTRAN, the name of a computer language which accopmlishes mathematical FORmula TRANslation; other terms consist of initial letters of compound terms, for example. TV which is much easier to say than television, or CRT than Cathrode Ray Tube. However, in order to enable teachers and administrators approaching the subject of computers for the first time to acquire a feel for computer terminology as quickly as possible, a Computer Term Glossary has been developed. The terms most frequently used are considered a basic vocabulary and are presented in the paragraphs which follow. The meanings of these terms can be derived from the way they are used in the paragraphs.

Computers are machines which have been designed to perform complex tasks with a minimum of human intervention. Because of their retention capability, their speed, and their ability to perform tasks like human beings, computers are occasionally personified; however, it should be emphasized that they remain machines. There are two general varieties of computers: analog and digital. Analog computers utilize continuously variable physical quantities, such electrical voltages and different electrical units, to represent the elements in a problem to be solved. The process of measurement is used to arrive at a final answer which can be read directly from a meter or other analog device. By contrast, digital computers utilize binary, a discontinuous numerical system consisting only of zeros and ones, to represent the elements in a problem. The way in which the numbers must be manipulated to arrive at a solution is programmed into the machine and the process of counting is used to obtain intermediate and final answers. Both analog and digital computers have been used to solve problems across academic disciplines, however, when the word computer is used with a modifer, it generally refers to a digital computer.

A rather important distinction is made between that part of a computer physically present as equipment, referred to as hardware, and that part of a computer representing instructions to the equipment and designated softward. Hardware exists either as a control processing unit, called CPN for short, or as peripheral devices. The CPN contains elements which keep track of what the computer is doing, store intermediate results, and perform calculations. Some of the storage is done in the CPU in electronic units called memory which can be accessed quickly. Less expensive retention, with slower retrieval capabilities, is contained in peripheral devices known as mass storage units. Another example of a peripheral device is a computer terminal which consists of a keyboard and a display device similar to a television screen. A terminal may be used either to access data which are stored in the computer or to generate instructions to the computer, a process known as programming. As a result of the advances

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in electronics and miniaturization, a complete microcomputer can now be contained in the same space as a portable television set.

Software exists in three main categories: operating systems, computer languages, and application programs. Operating systems contain utilities which automatically perform repetitive tasks that would be tedious for a human operator to undertake. In some instances because computers are able to execute millions of instructions per second, human operators would be unable to accomplish system tasks quickly enough to insure satisfactory computer utilization. Therefore, computer languages have been developed to improve the communication between human beings and these machines. For reliability and to maintain high operational speed the internal manipulations of computers are carried out in a binary language but the so-called high level languages have been designed to facilitate programming the solution of different kinds of computer applications. An application program, such as the instructions to generate a payroll, is the specific solution to a computer application as it has been programmed in the most appropriate computer language. Just as one does not need to know how to build an automobile in order to drive it, the user of a computer does not need to know how programming is accomplished or how the different elements of software colloborate to make computer utilization efficient. Because of the multiplicity of intricate tasks performed, especially for larger and more complex computer applications, programming has become a substantive intellectual activity.

This concludes the presentation of the basic vocabulary which has introduced you to twenty terms. A summary of these concepts and a listing of additional terms is provided for reader use.

SUMMARY

Two kinds of computers: **Analog** and **digital**.

Two parts of a digital computer : **hardware** and **software**.

Two subdivisions of hardware: **CPU** and **peripheral devices**.

Two kinds of retrieval units: **memory** (fast but expensive) and **mass storage** (of larger capacity and capable of being removed from the machine).

Three kinds of software: **operating systems, computer languages** and **application programs.**

Two kinds of computer languages: **binary** (the machines own language) and **high level languages** (optimized for undertaking specific tasks).

Two tasks which can be **executed** on computers: **access** to data stored in the computer and **programming** (generating instructions to the machine for the solution of a **computer application**.

Two different units that look similar: **terminal** (a **peripheral device** which must be connected to the computer to perform useful work) and **microcomputer** (a small, full-capability, **digital** computer).

The above terms are used so frequently across academic disciplines and in the workplace that it will be a distinct advantage to readers to master these terms before attempting to make use of the expanded listing.

BASIC VOCABULARY

access – process by which information contained either in memory or mass storage is made available to another sub-unit of a computer or, ultimately, to the user. Also refers to the ability of a computer terminal to communicate with a remote computer.

analog – pertains to the use of continuously variable physical quantities such as electrical voltages, to represent numbers in a calculation. Compare with digital. Also an abbreviated form for analog computer.

application program – category of software which includes the instructions to a computer that solve a particular problem. Such problems are referred to as computer applications. Compare with operating system and computer language.

binary – number system which uses a base of 2 rather than a base of 10 as is used in the conventional (decimal) number system. Binary numbers consist entirely of 0's and 1's. It is customary to use other number systems to represent binary numbers. Compare with octal and hexadecimal.

computer application – category of software which includes collections of instructions used in programming. Such instructions are designed so they can easily be converted to machine language for subsequent processing by a computer. Computer languages are of two general types: assembly languages or high-level languages. Compare with operating system and application program.

CPU – abbreviation for **C**entral **P**rocessing **U**nit. The components of a computer CPU include one or more registers for performing arithmetic functions, a control unit, and a memory unit. The CPU's of large computers are sometimes called mainframes.

digital – pertains to the use of numbers and counting to accomplish calculations or information processing. Compare with analog.

execution – automatic control of a computer which may represent only a few simple instructions or the loading of a complex number of routines.

hardware – category of computer components which involves equipment and excludes the instructions to the equipment which are subsumed under the designation software. Typically, hardware is divided into two large types: the central processing unit (CPU) and peripheral devices.

high-level language – type of computer language which is characterized by: ease of programming, English-like commands, and implementation on computers of diverse size and manufacturer. High-level languages may be general purpose such as BASIC and FORTRAN, or they may be specialized for particular computer applications in the way that PILOT and Coursewriter III have been developed especially for CBE. Compare with assembly language.

instruction – written statement, or its equivalent in either assembly language or machine language, which tells the computer to execute a specified single operation. A certain class of instructions called "memory reference instructions" contain the address of locations in memory which will be altered by the execution of that operation.

mass storage – term used to refer to a secondary, on-line repository for data bases and application programs. Access is not as rapid as from computer memory, but mass storage is more economical than storage in memory. Typically, mass storage occurs on diskette drives in microcomputers and on hard-disk drives in larger machines.

memory – organized collection of storage elements in the CPU of a computer into which instructions and data consisting of binary digits can be deposited and from which information can be retrieved. Compare with mass storage and off-line storage.

midicomputer – medium scale computers which represent an intermediate between maxicomputers and minicomputers both in terms of processing power and cost. Midicomputers range in cost from $100,000 to $1,000,000.

operating system – category of software which includes utility programs that automatically perform sequences of tasks which would be tedious for a human operator. Compare with computer language and application program.

peripheral device – type of computer hardware which includes all electronic and electro-mechical devices which can be attached to the computer except those subsumed under the designation CPU. Examples include line-printers, hard-disk drives, interfaces to the telephone system, etc.

programming – total process of developing solutions to the problems contained in computer applications. Programming involves the following steps: analysis, design, coding, testing, and implementation.

software – category of computer components which is restricted in instructions to the equipment (hardware). Typically, software can be divided into operating systems, computer languages, and application programs.

terminal – peripheral device which enables a user to interact with a computer. Computer terminals consist of three elements: a keyboard, either a display screen (CRT) or a hard-copy unit, and an interface which connects the terminal to the computer directly or, indirectly, through the telephone network.

EXPANDED TERM GLOSSARY

address – number which identifies a location in the memory of a computer. Addresses are usually expressed wither in binary notation or in a numerical

alphanumeric – pertains to a character set that contains both letters and numerals, and usually other characters except those used in drawing pictures. Compare with graphic.

analog computer – type of computer that uses electrical voltages, or other continuously variable physical quantities, to represent numbers in a calculation. The process of measurement is used to arrive at solutions in an analog computer. By contrast, the process of counting is used to arrive at solutions in a digital computer.

analog-to-digital converter – portion of a computer system which changes analog signals, usually electrical voltages, into discrete numbers capable of being processed by a digital computer. Electronic devices are also available to accomplish digital-to-analog conversions.

analysis – category of programming which involves gathering information about computer applications. This process ordinarily precedes the design phase of the effort. Compare with coding, testing, and implementation.

ANSI – acronym for **A**merican **N**ational **S**tandards **I**nstitution, an organization which supports the development of standard versions for computer languages.

APL – abbreviation for **A** **P**rogramming **L**anguage. APL is a general purpose, high-level language designed for interactive use which has powerful numerical and text-processing capabilities.

arithmetic processor board – type of special purpose board which makes possible more rapid computer calculations by carrying out in hardware certain functions which would require multiple instructions if performed in software. The AM-9511 integrated circuit represents one of several approaches to the design of such an electronic component board.

ASCII – acronym for **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange. ASCII refers to a convention for coding character sets in binary representation.

assembly language – type of computer language consisting of abbreviations for instructions (mnemonics) and defined symbols. A computer program written in assembly language is used as input to another computer program known as an assembler which then generates a machine language version of the original computer program. Assembly language programming retains the full power and flexibility of the computer but it has two disadvantages: each different model of computer has a unique assembly language, and programming in this medium is more tedious to perform than in programmming in a high-level language.

authoring aid – special type of application program which facilitates the programming of courseware by enabling a content expert to interact with the computer and have the coding performed automatically.

BASIC – acronym for **B**eginner's **A**ll-purpose **S**ymbolic **I**nstruction **C**ode, a general purpose, high-level language designed for interactive use which is intended to be simple to learn. BASIC is widely available on a variety of computers especially mini-computers and microcomputers.

batch-processing method of maximizing the utilization of computers in which a series of jobs are put through the CPU in sequence. Typically, the user is not able to interact with the computer during the execution of the job and thus this method is used for large-scale, data processing. Compare with timesharing.

baud – unit transmission rate which is equal to bits per second. Characters can be sent to hard-copy terminals by the computer at speeds from 110 - 1200 baud which translates to 10 - 120 characters per second. CRT terminals can display text at higher transmission rates, typically up to 960 characters per second.

BCD – abbreviation for **B**inary **C**oded **D**ecimal, a method for representing conventional (decimal) numbers in a binary number system which contains only the digits 0 and 1.

bit – smallest unit of data. This word, which is a contraction of binary digit, usually refers to a number which is represented either by a 0 or a 1. All the memory locations in a computer have addresses which are expressed in binary terms. Compare with byte and computer word.

bus – portion of motherboard in which component boards are installed so that they can obtain access to multiple power and communications channels. Modern computers have a single bus, the so-called "utilized" bus, which provides access to memory, controllers, and interfaces for each component board plugged into a slot on the bus.

byte – group of bits usually operated on as a unit. Since it customarily requires a byte consisting of 8 bits to define an alphanumeric character, the 8 bit byte has become a defacto standard. Computer memory and mass storage are measured in terms of bytes. The symbols **K** and **M** are used, respectively, to designate thousands and millions of bytes. Compare with computer word.

CAI – abbreviation for **C**omputer **A**ssisted **I**nstruction. General sense - all varieties of computer supported education (the more modern term is CBE). Spceific sense - those varieties of computer supported education which are primarily tutorial in their interaction. Compare with drill and practice, CMI, and simulation.

card – see component board.

cassette drive – type of computer mass storage device which utilizes the audio cassette with its 1/8" magnetic tape as the storage medium. Information contained on magnetic tape is usually stored serially and not susceptible to rapid retrieval. Such units are frequently used on low-cost, microcomputers and terminals. Compare with diskette drive.

CBE – abbreviation for **C**omputer **B**ased **E**ducation, a general term which encompasses a variety of techniques used to provide computer support in instruction. These vary from drill and practice through CMI and CAI (specific sense), to simulation.

CBEM – abbreviation for **C**omputer **B**ased **E**ducation **M**aterials. See courseware.

central processing unit – see CPU.

character – see alphanumeric, graphic.

chip – see integrated circuit.

CMI – abbreviation for **C**omputer **M**anaged **I**nstruction, those varieties of CBE which involve primarily testing in their interaction. Compare with drill and practice, CAI (specific sense), and simulation.

COBOL – acronym for **CO**mmon **B**usiness **O**riented **L**anguage, a special purpose, high-level language designed for batch-processing which has the features required for large-scale data processing. COBOL is widely available on a variety of computers, especially maxicomputers.

coding – category of programming which involves generating the computer language version of the solution to the computer application that emerged from analysis and design. Compare with analysis, testing, and implementation. Also used to refer to a means of preparing information for storage in a form which enhances subsequent processing. See information representation.

component board – physical part on which electronic components are mounted. Component boards have "edge connectors" which make contact at the slots of the bus to communicate with power channels and information channels. Multiple component boards are mounted on a common multi-channel device known as a bus, There are various kinds of component boards such as CPU, memory, interface, controller, and special purpose boards.

computer assisted instruction – see CAI.

computer games – amusement which has been programmed so that the computer performs the necessary calculations. The dividing line between computer games and education is not always discernible since playing computer games teaches one how to interact with a computer.

computer literacy – knowledge of computer science, more specifically the rudiments of how computers function and how human beings are able to interact with computers.

computer mainframe – see CPU.

computer memory – see memory.

computer model – see simulation.

computer program – see program.

computer-readable – pertains to the storage of information or programs in such form that they can be re-entered into mass-storage automatically. The media which permits such re-entry include punched paper tape, punched cards, magtape, diskettes, and disks.

computer terminal – see terminal.

computer word – pertains to the number of bits used in the registers of a computer system. Since length of the computer word determines how many memory locations can be addressed in a single instruction, larger and faster computers tend to have longer computer words.

configuration – used to designate the type and number of such hardware components as CPU's, memory, mass storage, line printers, and other peripheral devices.

console – arrangement of indicators and controls at the CPU which enable manual operation of the computer.

control unit – component of computer central processing unit (CPU) which determines what is the next action to be taken automatically by the computer. Compare with register and memory.

controller – variety of component board in a computer system which is responsible for high-speed communication between memory and mass storage devices in either direction. Controllers generally function automatically as a result of instructions which are a part of the operating system.

core – early term for memory since binary storage units formerly used magnetic technology to determine whether they contained a 0 or a 1.

core resident – computer instructions which remain in memory at all times so that they provide very rapid execution. Because memory is more limited than mass storage a compromise is usually achieved betweem storing programs in one site or the other, based on desired performance characteristics.

courseware – term used to designate those application programs, also called CBEM, which have educational objectives. Special purpose, high-level languages and authoring aids have been developed to facilitate the production of courseware.

Coursewriter III – special purpose, high-level language developed by IBM to facilitate CBE. Coursewriter III is primarily available on maxi-computers.

CP/M – trademark for a popular microcomputer operating system developed by Digital Research, Inc. CP/M can operate on a number of different computers, is able to support a variety of mass storage devices, can be used with more than one computer language, and therefore facilitates the transfer of application programs from one computer to another.

CRT – abbreviation for **C**athode **R**ay **T**ube. CRT refers to the screen used in oscilloscopes, television sets, and computer terminals. Compare with video monitor.

cursor – movable indicator on a CRT. The cursor is used to identify the position at which the next character typed from the keyboard will be displayed.

data acquisition – process whereby information derived from analytical instruments (usually in analog form) is captured, converted to digital form, if necessary, and stored in computer readable form, usually on a mass storage device or on magnetic tape.

data base – collection of information which is fundamental to a particular effort. Generally, it is implied that this information is available in computer readable form for either on-line or off-line access. However, some data bases which have been generated by a computer exist only in hard-copy form.

data generation – automatic creation of numbers by the computer. This can be a particular value, for example, when different sets of numbers may be desired so that individual student can practice statistical analysis on unique but similar data.

data reduction – process whereby raw numbers, usually produced by analytical instruments, are converted to refined measurements. Data reduction implies statistical analysis with indications of significant variations from expected outcomes.

debugging – see testing.

design – category of programming which involves the way in which a computer program is organized to produce the desired solution. Compare with analysis, coding, testing, and implementation.

disk memory – see mass storage.

diskette – circular, flexible medium with magnetic surfaces on which information can be stored for subsequent computer access. This medium is one of the least expensive forms of mass storage.

diskette drive – type of computer mass storage device which utilizes a rotating flexible magnetic surface as the storage medium. Information contained on diskettes is stored so that any item can be retrieved relatively quickly. Such units are characteristic of moderate-priced microcomputers and terminals. Compare with hard-disk drive.

display screen – see CRT.

documentation – pertains to written information appended to computer programs so as to make it easier to understand how they were designed or how they are supposed to be implemented.

DOS – acronym for **D**isk **O**perating **S**ystem, a form of operating system which makes use of the mass storage capabilities of disks or diskettes to provide extended operating system capabilities. Compare with core resident.

drill and practice – those varieties of CBE which involve repetitive solutions to simple problems. This approach is used primarily at lower academic levels. Compare with CMI, CAI (specific sense), and simulation.

edge connectors – see component board and slot.

EPROM – see PROM.

firmware – term used to designate programs stored in read-onoy-memory (ROM). Ordinarily, firmware cannot be altered. This provides a hardware approach to the packaging and marketing of software.

floating point notation – see scientific notation.

floating-point processor – arithmetic unit used to perform calculations at high speed. A floating-point processor can be devised either in hardware or in software.

floppy disk – see diskette.

FOCAL – acronym for **F**ormulating **O**n-line **C**alculations in **A**lgebraic **L**anguage, a general purpose, high-level language which is easy to learn and is designed for interactive use. FOCAL was orginally developed by the Digital Equipment Corporation for use in minicomputers; because of its proprietary nature it is not as widely disseminated as BASIC.

FORTRAN – acronym for **FOR**mula **TRAN**slator, a general purpose, high-level language which is especially useful for scientific computing. FORTRAN was orginally developed for batch-processing but interactive versions now exist. FORTRAN is probably the most widely implemented computer language.

format – pre-determined arrangement of bits or characters used either on a mass storage medium or in computer output.

free text entry – ability of an application program to accept user input without the major restrictions which are required by many computer languages. This capability implies that the application program includes routines to parse the text, extract its meaning, and branch to an appropriate place in the program to meet the user's need.

function generator – portion of an analog computer which is capable of converting a mathematical expression into simpler terms, usually electrical voltages, resistances, and capacitances, for the purpose of simulating mathematical relationships under conditions which are susceptible to easy manipulation.

graphic – ability to plot points, draw lines, or otherwise create pictures either in hard-copy or on the CRT screen of a computer or a terminal. Compare with alphanumeric. More information in definition of video generator board.

hard-copy – piece of paper on which a computer device has written. This term is used to make a distinction between permanent records and information provided on a CRT which is not permanent unless the user makes a record of it. Also refers to terminals and line printers which generate permanent records (output).

hard-disk drive – computer mass storage device which utilizes rotating platters coated with a magnetic surface for information storage, generally the fastest of the mass storage devices. The speed of rotation and the number of read/write heads determine how rapidly information can be accessed. Units with multiple platters are used in the largest computers.

hexadecimal – a number system which uses a base of 16 rather than a base of 10 as is used in the conventional (decimal) number system. (The letters A-F are appended beyond 9 to provide the additional single character representations for 10-15.) One hexadecimal digit is capable of representing the information contained in four binary digits. Compare with octal.

hybird computers – used to describe computers which have both analog and digital capabilities. Hybird computers are relatively unusual, but analog-to-digital converters which permit digital computers to process analog information are widespread.

IC – abbreviation for **I**ntegrated **C**ircuit.

implementation – general sense - the way in which a computer assisted process fits into the overall goals of a human endeavor. Specific sense - category of programming which involves the final operation of the program in the environment for which it was developed. Compare with analysis, design, coding, and testing.

in-house compute – computer available within an institution. The costs incurred in assessing an in-house computer are generally less than using a service bureau, unless the machine is under-utilized which prevents cost-effective implementation.

information representation – process whereby information is coded before being stored on a computer. Although modifying the representation of the information may save space on the mass storage device, it generally complicates the process of information retrieval unless the coding provides specific means to enhance the retrieval process.

information retrieval – process whereby information stored in memory or mass storage is accessed, decoded if necessary, and made available to the user.

initializing – process performed at the outset before a substantive task can begin. For example, in an application program it may be necessary to reset the values of the variables before another set of data can be processed; this is called initializing. Similarly, when first beginning to use a computer, it is necessary to load the operating system into memory and to request the computer to begin execution at a particular address.

input – short-hand way of referring to any information, analog or digital, which is presented to the computer for subsequent processing. Compare with output.

integrated circuit – electronic unit which combines a single miniaturized component which minimizing reliability. Because of their very small size these units are sometimes called "chips."

integrator – component for an analog computer which is capable of processing more than one signal and presenting the result in a single combined entity, usually an electrical voltage.

interactive – method of maximizing access to information contained in mass storage by which the user is able to communicate with a data-base by way of the computer console or a remote computer terminal.

interface – kind of computer board which provides the electronics to permit one portion of the computer to communicate with another. For example, before a line printer can be attached to a computer an interface must be present which accepts information as the computer delivers it, and converts it into a form which the line printer can use to create hard-copy.

K – abbreviation for **K**ilo or thousand (actually, 1,024 or 2 to the 10th power). Used in the designation of the size of memory and mass storage. For example, many microporcessors have as little as 16 Kbytes or RAM.

keyboard – element of a computer terminal or console which enables alphanumeric information to be sent to the computer. Most computer keyboards are variants of the standard typewriter keyboard.

language – see assembly language, computer language, high-level language, and machine language.

legal disconnect – refers to fulfilling the prescribed procedure for logging-off a time sharing computer system, as opposed to merely dropping the telephone connection.

levels of interaction – terms used to emphasize that there are hierarchies of instructions to the computer.

line printer – peripheral device which causes hard-copy to be generated by the computer. As the name implies, an entire line is printed at one stroke which permits rapid listing of information.

loading a program – process in which the computer places the binary version of an application program into memory prior to requesting execution of that program. This is an example of a task (utility program) usually performed by an operating system.

login requirement – process which must be performed in order for a time-sharing computer to recognize an authorized user.

M – abbreviation for **M**ega or million (actually 1,048,576 or 2 to the 20th power). Used in the designation of the size of mass storage. For example, multi-platter hard disk drives may have as many as 80 Mbytes of mass storage.

machine code – see machine language.

machine language – representation of information in a form which can be processed by the computer. Machine language consists entirely of binary representation, hence only the number 0 and 1 are used. Such representation is generally uncomprehensible to human beings. Each individual computer model has a unique machine language. The object generated from an assembly language source is in machine language which is sometimes also called machine code.

magtape – acronym for **mag**netic **tape**, generally refers to ½" magnetic tape with storage at 800 and 1600 bits per inch. This size has become an industry standard for medium-sized and larger computers. Storage on magtape is referred to as off-line storage when the magtape is not mounted on an active tape drive connected to the computer.

mainframe – see CPU.

maxi-computer – largest category of computers. Maxi-computers tend to be very fast, have large amounts of mass storage, and accommodate many tasks at the same time. They are very expensive, generally in excess of $1,000,000.

megabyte – see M.

microcomputer – smallest category of computers. Microcomputers tend to be miniaturized, are often dedicated to performing simple tasks, and do not usually have much flexibility. Wrist watches and hand-held calculators are examples of one end of the scale. Personal computers which cost $10,000 or less represent the upper cost limit of these devices.

minicomputer – category of computers representing the original effort, circa 1960, to offer smaller computers at a lower cost. Early machines in this category cost about $25,000. They continued to become less expensive, but now that this effort has created microcomputers, minicomputers encompass a range of cost from approximately $10,000 to $100,000.

minifloppy disk drive – smaller version of the diskette drive. Standard diskettes are 8" in diameter and when recorded on one surface in single density format contain 256,000 bytes of storage. Minifloppy diskettes are 5¼" in diameter and when recorded on one surface in single density format contain approximately 100,000 bytes of storage.

model – in a computer simulation, this refers to the conceptualization of the program prior to attempting to program the simulation. Frequently, models are couched as a series of mathematical relationships or equations. In describing hardware, the word model refers to a particular version of the equipment.

MOS – acronym for **M**etal **O**xide **S**emiconductor electronic memory which has replaced the earlier magnetic memory (core).

motherboard – principle component of a microcomputer which contains the power supply, the bus, and a front panel which may have indicators and controls that constitute a computer console. Component boards are installed on the bus to give a particular microcomputer its desired capabilities.

multiplier – component of an analog computer which is capable of multiplying two signals together and presenting the product in a single entity, usually an electrical voltage.

network – collection of computers, communication links, and telephone lines which make it possible for a user to communicate with one or more remote computers without having to pay prohibitive long distance telephone charges. A user needs a computer terminal and an interface to the telephone system in order to access a remote computer.

object – binary form of an assembly language program which is created by the assembler. It consists of 0's and 1's and can be directly executed by the computer.

octal – pertains to a number system which uses a base of 8 rather than a base of 10 as in the conventional (decimal) number system. Octal uses only the digits 0 through 7. One octal digit provides a convenient numerical representation for the information contained in three binary digits. Compare with hexadecimal.

off-line – information stored in computer-readable form (punched cards, punched paper tape, magtape, diskettes, or disks) but not currently in the computer and therefore unavailable for direct access. Compare with off-line.

operational amplifier – component of an analog computer which not only amplifies a signal but also performs some operation, such as reversing the sign, or taking a derivative of the signal.

OS/8 – abbreviation for the device independent, operating system for the Digital Equipment Corporation PDP-8 minicomputer. Device independent means that PDP-8's with different amounts of memory or mass-storage, and different complements of peripheral devices can all be using a standard programming environment which facilitates the transportability of programs from one machine to another.

output – short-hand way of referring to any information, presented on a CRT or in hard-copy which is the result of the computer following a set of instructions or an application program. Compare with input.

parity check – process whereby transfers of information within the computer are checked for the occurrence of the same number of binary 1's in each computer word transferred. Memory which has parity checking built-in, will require one more bit than the length of the computer word for that CPU.

patch panel – component of an analog computer which simplifies converting the problem into an electrical analog (essentially to program the analog computer) by plugging in wires from one component of the analog computer to another as indicated on the patch panel.

performance enhancer – see arithmetic processor board and floating-point processor.

personal computer – term used to describe either a microcomputer or a minicomputer, which is intended for use by only one person. Personal computers which have an interface to the telephone system may also be used as computer terminals to larger machines.

pin assignments – refers to multiple connectors in computer buses, component boards, plugs or sockets and the signals assigned to each connector. Often devices which are physically compatible because they have the same number and arrangement of connectors, become incompatible when the signal lines are not assigned to the same connectors.

plotting capability – the ability of a CRT or a hard-copy device to produce graphic output.

pot – abbreviation for potentiometer, a variable electrical resistance. Pots are used in analog computers to change the conditions of the problem.

power supply – component of a motherboard which converts conventional electricity (110 volt, 60 cycle AC) into DC voltages. These are used to operate modern electronic units mounted on component boards and plugged into the bus.

printer – see line printer.

program – collection of instructions to a computer. More information in definition of programming. Programs for digital computers are written in computer languages. Programs for analog computers consist of equations and diagrams that indicate the analog operators which will be used to arrive at the solution.

programming aid – see authoring aid.

PROM – acronym for **P**rogrammable **R**ead **O**nly **M**emory. As originally developed, ROM could not be altered once it had been created. PROM was the first step in improved flexibility in firmware. Subsequently, memory was constructed in integrated circuits whose contents could be erased (EPROM) with ultraviolet light and then reprogrammed.

RAM – acronym for **R**andom **A**ccess **M**emory, computer memory which consists of electronic units and is capable of having its contents changed. More information in the definitions of memory and ROM.

random-access storage – see mass storage.

real-time clock – peripheral device which enables the computer to keep time in human dimensions, i.e., seconds, minutes, hours, days, months, and years. Real-time clocks tick at relatively high speed and must be supported by application programs to convert this information into real-time.

register – component of a CPU. This electronic device is able to retain as many bits of information as are present in the computer word of the particular machine. Arithmetic functions and evaluations (whether the register contains 0 or a negative or a positive number) must be performed in registers. The latter are also used to store intermediate values in certain calculations or retrieval operations.

remote computer – a computer which is not located at the site of access. The term implies that such a machine can be accessed by way of the telephone system and a computer terminal.

resolution – term used to describe the capacity of a video monitor to display pictures (graphics). The higher the resolution the more detail is visible in the ultimate screen image.

ROM – abbreviation for Read Only Memory. Describes computer memory whose contents can be read but cannot be altered. Compare with RAM.

S-100 bus – a unitized bus for microcomputers based on either the Intel 8080 or the Zylog Z-80 integrated circuit. Several different manufacturers have developed component boards for the S-100 bus, therefore it has become a "standard" bus for these popular microcomputers.

scientific notation – method of expressing numbers in compact form in which the integer and exponent portions of the number are separately represented. This notation is sued to enhance the speed of a floating point processor.

semiconductor memory – see MOS.

service bureau – source of computer services on a commercial basis. Compare with in-house computer.

simulation – a variety of CBE which involves developing a computer model of a human activity in order to be able to learn more about that activity. Compare with drill and practice, CMI and CAI (specific sense).

slot – a position on a unitized bus were a component board can be installed. Typically, there are 10-40 slots on a bus, but it is generally possible to extend the bus, to another unit with additional slots. The component board is positioned on the bus by inserting the "edge connectors" in the slot.

solid state memory – see MOS

source – see assembly language and machine language.

special purpose board – one of several types of component boards which carry out such functions as improving the speed of calculations (arithmetic processor board or floating point processor) or enabling the conversion of analog signals to digital format.

tape memory – see magtape.

television – see video technology

testing – category of programming involves indentifying errors in computer language syntax, flaws in logic, and other impediments to the operation of a computer program. This process is also called "debugging."

time-sharing – method of maximizing the utilization of computers in which more than one user is able to share the computer by having the operating system provide each user in sequence an allotted increment of computer time. Compare with batch-processing.

transportability – extent to which courseware and other application programs can be transferred from one computer to another without having to rewrite the program.

turn-around time – in a batch-processing environment the time between submitting a job request and the receipt of the output.

unitized – see bus

user memory partition – allocation of memory which permits more than one user to have interactive access to a computer running under time-sharing.

utility program – sub-unit of an operating system which performs repetitive tasks without requiring human intervention.

variable – term used in programming to refer to a particular symbol, such as the letter x, which may take on one value at one point in time and another value at a different point in time.

video generator board – a component board of the category of interfaces which creates a screen display for delivery to a video monitor. Relatively primitive video generator boards determine the number of lines to be displayed, the number of characters per line, and the character set (usually alphanumeric). More advanced equipment permits graphics, variation of intensity, and even color displays.

video interface – see video generator board

video monitor – screen used in computer terminals where the display is based on video technology. A video monitor contains all the components of a television set except those which make it possible to receive broadcast television programs.

video technology – pertains to hardware devices which make use of the developments created for and by the television industry.

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